



Most common organisms studied

(wadable streams)

- Fish



- Algae



- Macroinvertebrates

Why use benthic macroinvertebrates as water quality indicators?

- They are affected by the physical, chemical, and biological conditions of the stream
- They are relatively immobile and show the effects of short and long term pollution events
- Some are very intolerant of pollution
- They are a critical part of the food web
 - Primary link between the basis of the food web (algae, organic detritus, microorganisms)
And
Fish
- They are relatively easy and inexpensive to sample and identify

Sensitive Taxa

Ephemeroptera (mayflies)

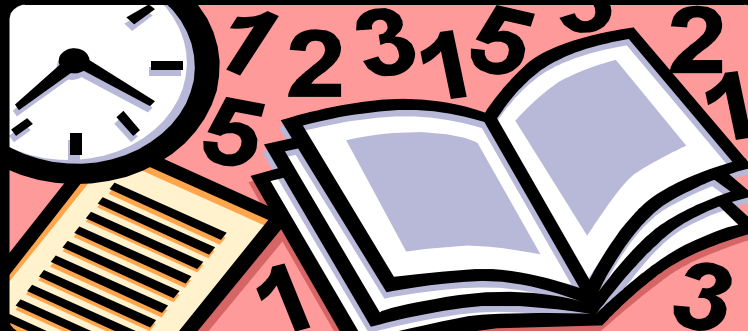
Plecoptera (stoneflies)

Trichoptera (caddisflies)



Quality Assurance/Quality Control

- Documents your entire monitoring plan
 - Where, how, what, etc.
- Written guidance that ensures everyone knows what is to be done and exactly how it will be done
- Helps others understand your data



Quality Assurance

Quality assurance is a system you put into place to ensure that your data will meet standards of quality that you define.

What is Quality Assurance (QA) -
A management system which includes:

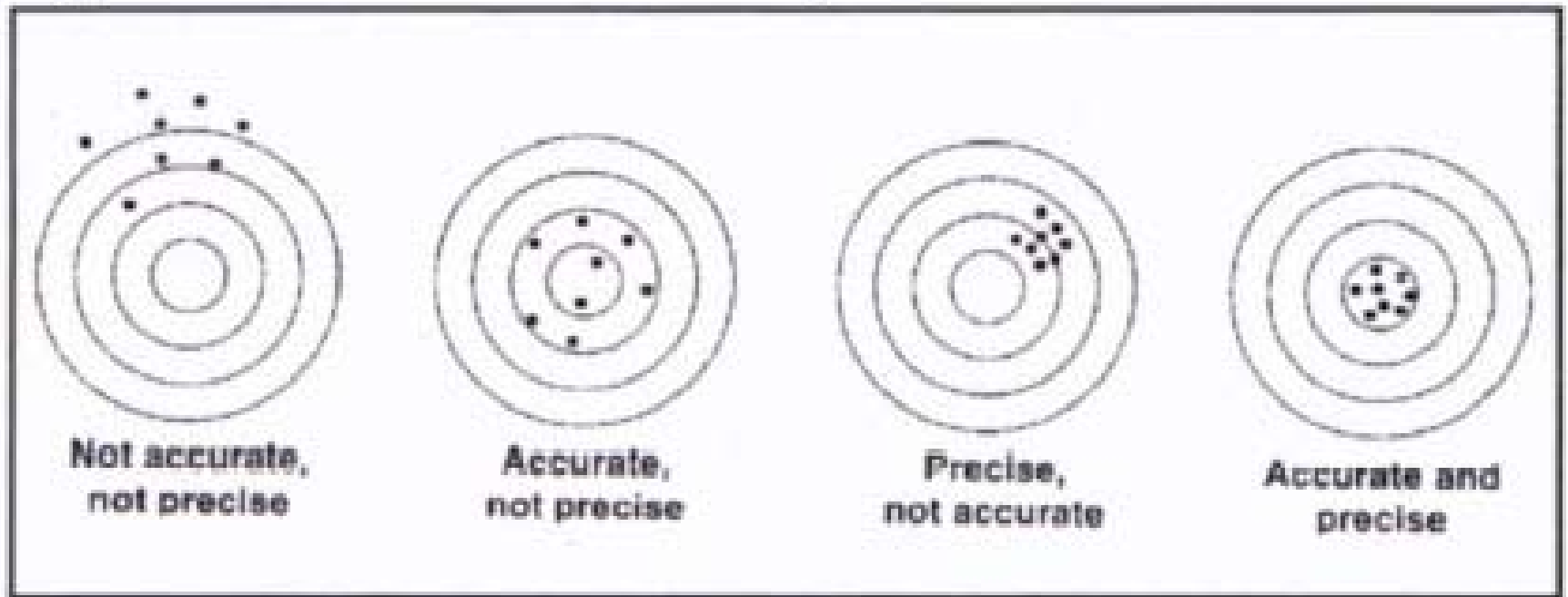
- organization and planning
- data collection
- quality control
- documentation
- evaluation
- reporting



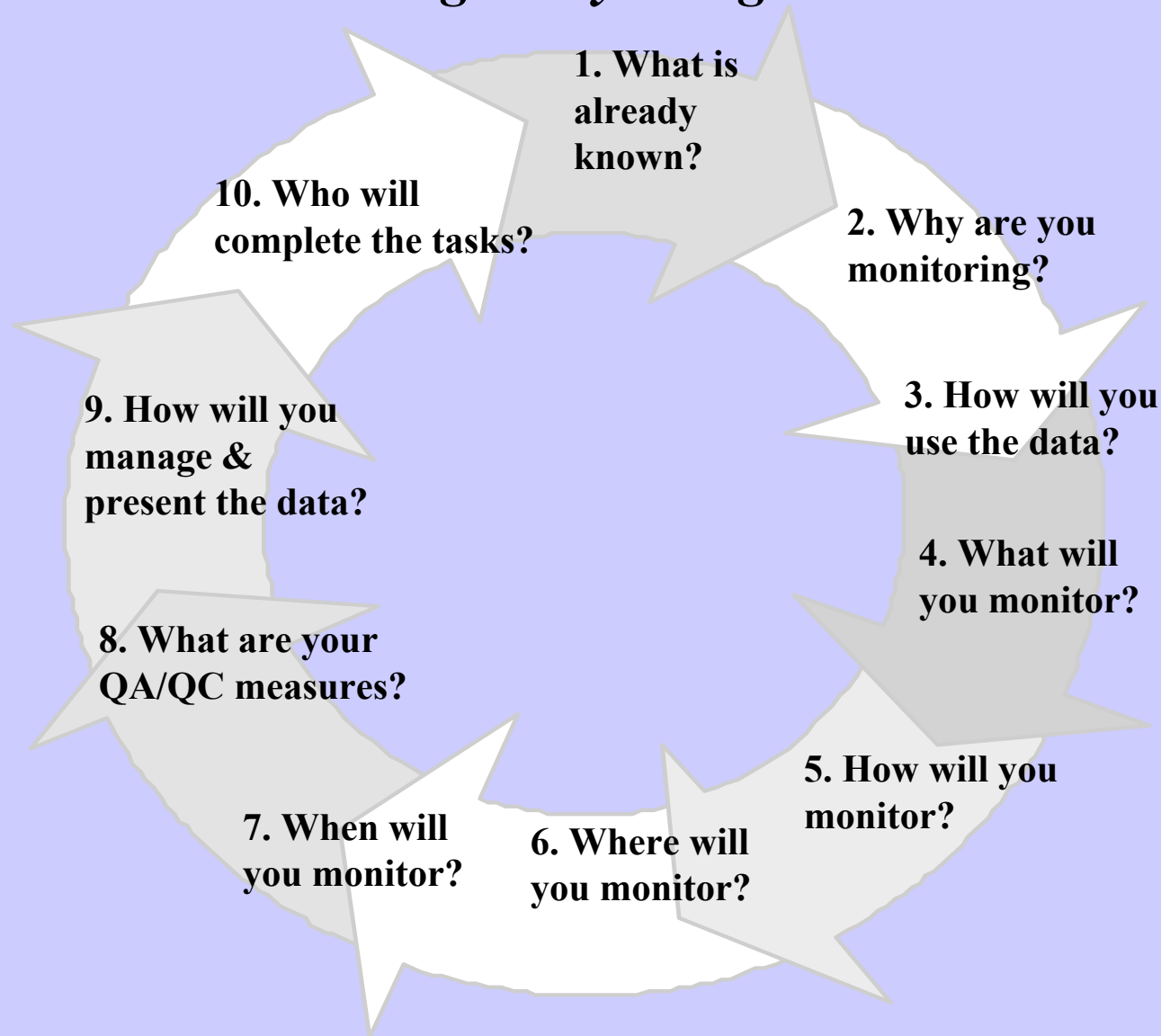
Quality Control

- **Accuracy:** how close to the real results you are
- **Precision:** how reproducible your results are

Figure 1: Precision and Accuracy Illustrated



Monitoring Study Design Process



Why are you monitoring?

It is important that your group reaches a consensus about the purpose of your monitoring program. Identify questions that if answered, could provide information to influence decision-makers and your group's targeted data users. Then, determine how monitoring can help answer these questions and achieve your groups' goals.

Examples:

- Is the water quality meeting or exceeding state standards?
- How are failing septic systems affecting water quality?
- How will proposed development affect water quality?
- Is the local quarry operation in compliance?



How will you use the Data Collected?

Match your monitoring purpose to your data users.

Potential Data Users

- *Watershed group & volunteer monitors*
- *Planning commissions*
- *State agencies for use in the 305(b) report and enforcement of 303(d) list*



How will you monitor?

Determining how you will monitor involves making choices as to the appropriate sampling methods that meet your data quality objectives.

Kicknet

Common procedure:

- conduct 2 -4 separate kicks, often from a 100-yard reach
- composit samples
- sort and ID in streamside or lab
- 100 - 200 organism sub-sampling common



Kicknet

Advantages:

- rapid screening of large number of sites
- easy, fast, inexpensive
- standardized protocols

Disadvantages:

- qualitative
- limited habitat assessment



D-Frame (dip) net



- total of 20 jabs taken from all major habitat types
- different habitats sampled in rough proportion to their area

Disadvantage:

- qualitative

Advantage:

- quick and easy
- can sample multiple habitats



Surber Sampler

Advantages

- Quantitative

Disadvantages

- Riffle habitat only
- Longer processing time and resources may be required



Hess sampler



Artificial Substrate

Advantages:

- Can sample difficult or unsafe areas
- Inexpensive, easy design
- mimic natural substrate

Examples:

Rock bag

Leaf packs

Hester dandy

Disadvantages:

- need to place and retrieve several weeks later
- artificial environment
- limited habitat

Reference Site

Reference sites: locations in similar waterbodies and habitat types at which data can be selected for comparison with test sites.

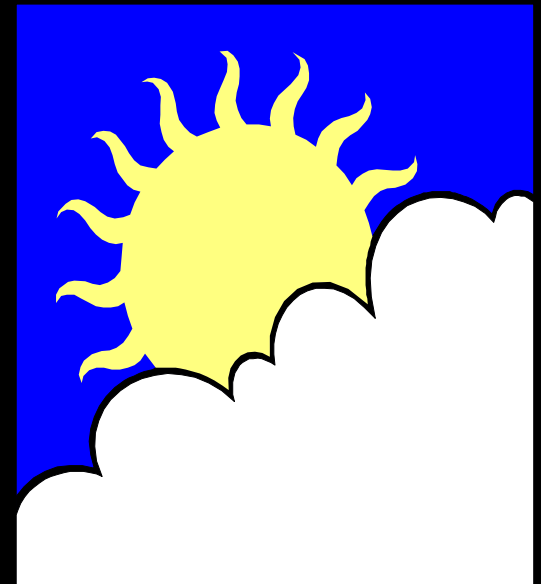
Characteristics of Ideal Reference Sites

- Pristine probably does not exist so look for minimally impaired.
 - Extensive, natural vegetation
 - Diversity of substrate materials and channel structure
 - No upstream impoundments
 - Minimal nonpoint source problems (agriculture, urban, logging, mining)



When will you monitor?

- Time of Year: The macro community changes with the seasons
 - Spring:
 - Many insects are fairly large & mature, therefore easier to identify
 - Macros collected in Spring have generally been active as larvae since September and thus the number and types collected reflect at least several months of environmental variability
 - Late Summer
 - Hot temperature, low flow
 - Macro's may be most stressed
- Frequency– consider resources and data requirements



QA/QC - Sampling

- Equipment
 - mesh size
- Approaching sampling site
- Consistency of sampling
 - Area of kick?
 - Time of kick?
 - Kick or kick & rub?
- Have experienced members in each team
- Thoroughly rinse equipment
- Chain of custody



Quality Control - Field

- Labels/records
 - Sampling location, site number, sample number, who collected the sample
 - Waterproof pen
 - Labeling collection jars

MSWC21, _____ an _pm
WhiteClayCreek Streamwatch
DE:NewCastleCounty Site#_____
3941' 31 'N 743' 3" W

Cd: _____ 24March-01

Quality Control - Sorting

Many programs have a monitoring coordinator or QC leader to verify sorts, counts, ID

- Verify nets, buckets clean & rinsed
- Check debris (field or lab)
 - Checks preformed by coordinator or qualified volunteer
- Keep a voucher collection
- Keep a sample log

Quality Control - Identification

- Resources - keys, guides, manuals, reference collection
- Check ID's
 - Internal vs external
 - Field vouchers
- Check counts
- Record data
- Keep sample log

Important Rules of Consistency for Counting

- Do not count terrestrial insects.
- Do not count earthworms.
- Do not count empty cases.
- Do not count cast skins.
- Do not count adult Diptera, but newly emerged adults may be placed in the vial.
- Do not count body parts, if an insect is dismembered, the only part to be counted is the head. Whenever possible all the body parts can be reunited in the sample.
- Use of the counter, especially with large numbers, enables the person doing the counting to be more accurate.

Training

Schedule regular QA/QC trainings

Schedule prior to collection and/or identification



Don't
forget the
data!

EPHEMEROPTERA	- -- --	-- ---		
EPHEMERIDAE	4	CG	BU	1
TRICORYTHIDAE	4	CG	SP	
CAENIDAE	4	CG	SP	
EPHEMERELLIDAE	4	CG	CR	599
OLIGONEURIIDAE	2	CF	S W	
LEPTOPHLEBIIDAE	2	CG	CR	3
BAETIDAE	4	CG	CG	34
HEPTAGENIIDAE	4	SC	CG	39
POTAMANTHIDAE	4	CG	BU	
POLYMITARCYIDAE	2	CG	BU	
AMELETIDAE	0 *			

Kingdom *Animalia*

Phylum *Arthropoda*

Class *Insecta*

Order *Ephemeroptera*

Family *Baetidae*

Genus *Baetis*

Species *cingulatus*

